

HISTORIC PROPERTY INVENTORY FORM

IDENTIFICATION SECTION

Field Site No. 291-T OAHP No. _____ Date Recorded 29 Feb 1996
Site Name Historic Exhauster Building and Stack Revised 10 July 1997
Common T-Stack
Field Recorder M.S. Gerber
Owner's Name U.S. Department of Energy, Richland Operations Office
Address P.O. Box 550
City/State/Zip Code Richland, WA 99352

Status

☒ Survey/Inventory
☐ National Register
☐ State Register
☐ Determined Eligible
☐ Determined Not Eligible
☐ Other (HABS, HAER, NHL)
☐ Local Designation

Photography

Neg. #96010247-11 CN and -12 CN
Photography Neg. No. HCRL: Roll 272, frames 35-36
(Roll No. & Frame No.)
View of South and east exterior facades
Date January 1996 and 10 July 1997

Photo at right: Roll 272, frame 36
View of south and east facades

Classification ☐ District ☐ Site ☒ Building ☒ Structure ☐ Object
District Status ☒ NR ☐ SR ☐ LR ☐ INV
Contributing ☒ Non-Contributing
District/Thematic Nomination Name Hanford Site Manhattan Project and Cold War Era Historic District

Description Section

Materials & Features/Structural Types

Building Type Industry
Plan Irregular
Structural System Concrete/Concrete Block
No. of Stories One

Roof Type

☐ Gable ☐ Hip
☒ Flat ☐ Pyramidal
☐ Monitor ☐ Other (specify) _____
☐ Gambrel
☐ Shed

Cladding (Exterior Wall Surfaces)

☐ Log
☐ Horizontal Wood Siding
Rustic/Drop ☐
Clapboard ☐
☐ Wood Shingle
☐ Board and Batten
☐ Vertical Board
☐ Asbestos/Asphalt
☐ Brick
☐ Stone
☐ Stucco
☐ Terra Cotta
☒ Concrete/Concrete Block
☐ Vinyl/Aluminum Siding
☐ Metal (specify) _____
☐ Other (specify) _____

Roof Material

☐ Wood Shingle
☐ Wood Shake
☐ Composition
☐ Slate
☒ Tar/Built-up
☐ Tile
☐ Metal (specify) _____
☐ Other (specify) _____
☐ Not visible

Foundation

☐ Log ☐ Concrete
☐ Post & Pier ☐ Block
☐ Stone ☒ Poured
☐ Brick ☐ Other (specify) _____
☐ Not visible

Integrity

(Include detailed description in
Description of Physical Appearance)

	Intact	Slight	Moderate	Extensive
Changes to plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to windows	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to original cladding	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to interior	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify) <u>Equipment</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

State of Washington, Department of Community Development
Office of Archaeology and Historic Preservation
111 21st Avenue Southwest, Post Office Box 48343
Olympia, Washington 98504-8343 (206)753-4011

LOCATION SECTION

Address Building 291-T, 200 West Area
City/Town/County/Zip Code Richland/Benton County/99352
Twp 12 N Range 26 E Section 6 1/4 Section NW 1/4 1/4 Sec NW
Tax No./Parcel No. _____ Acreage _____
Quadrangle or map name Gable Butte, Washington Quad. - 7.5 min. series 1986
UTM References Zone 11 Easting _____ Northing _____
Plat/Block/Lot _____
Supplemental Map(s) _____



High Styles/Forms (Check one or more of the following)

<input type="checkbox"/> Greek Revival	<input type="checkbox"/> Spanish Colonial Revival/Mediterranean
<input type="checkbox"/> Gothic Revival	<input type="checkbox"/> Tudor Revival
<input type="checkbox"/> Italianate	<input type="checkbox"/> Craftsman/Arts & Crafts
<input type="checkbox"/> Second Empire	<input type="checkbox"/> Bungalow
<input type="checkbox"/> Romanesque Revival	<input type="checkbox"/> Prairie Style
<input type="checkbox"/> Stick Style	<input type="checkbox"/> Art Deco/Art Moderne
<input type="checkbox"/> Queen Anne	<input type="checkbox"/> Rustic Style
<input type="checkbox"/> Shingle Style	<input type="checkbox"/> International Style
<input type="checkbox"/> Colonial Revival	<input type="checkbox"/> Northwest Style
<input type="checkbox"/> Beaux Arts/Neoclassical	<input type="checkbox"/> Commercial Vernacular
<input type="checkbox"/> Chicago/Commercial Style	<input type="checkbox"/> Residential Vernacular (see below)
<input type="checkbox"/> American Foursquare	<input checked="" type="checkbox"/> Other (specify)
<input type="checkbox"/> Mission Revival	<u>Industrial Vernacular</u>

Vernacular House Types

<input type="checkbox"/> Gable Front	<input type="checkbox"/> Cross Gable
<input type="checkbox"/> Gable Front and Wing	<input type="checkbox"/> Pyramidal/Hipped
<input type="checkbox"/> Side Gable	<input type="checkbox"/> Other (specify) _____

NARRATIVE SECTION

Study Unit Themes (check one or more of the following)

- | | |
|--------------------------|-------------------------------------|
| <input type="checkbox"/> | Agriculture |
| <input type="checkbox"/> | Architecture/Landscape Architecture |
| <input type="checkbox"/> | Arts |
| <input type="checkbox"/> | Commerce |
| <input type="checkbox"/> | Communications |
| <input type="checkbox"/> | Community Planning/Development |

- | | |
|--------------------------|---------------------------------|
| <input type="checkbox"/> | Conservation |
| <input type="checkbox"/> | Education |
| <input type="checkbox"/> | Entertainment/Recreation |
| <input type="checkbox"/> | Ethnic Heritage (specify) _____ |
| <input type="checkbox"/> | Health/Medicine |
| <input type="checkbox"/> | Manufacturing/Industry |
| <input type="checkbox"/> | Military |

- | | |
|-------------------------------------|---|
| <input type="checkbox"/> | Politics/Government/Law |
| <input type="checkbox"/> | Religion |
| <input type="checkbox"/> | Science & Engineering |
| <input type="checkbox"/> | Social Movements/Organizations |
| <input type="checkbox"/> | Transportation |
| <input checked="" type="checkbox"/> | Other (specify) <u>Manhattan Project and Cold War Eras</u> |
| <input checked="" type="checkbox"/> | Study Unit Sub-Theme(s) <u>Health Safety, Operations Support;
Waste Management (Air)</u> |

Statement of Significance

Date of Construction 1943-44 Architect/Engineer/Builder E.I. du Pont de Nemours Corporation

☒ In the opinion of the surveyor, this property appears to meet the criteria of the National Register of Historic Places.

☒ In the opinion of the surveyor, this property is located in a potential historic district (National and/or local).

The 291-T Exhauster Building and Stack were constructed during World War II to provide the exhaust system for the 221-T Building (T-Plant), and to provide adequate ventilation for the "canyon" portion of T-Plant. The Exhauster Building and Stack served to propel the off-gases from T-Plant dissolver cells (Cells 5 and 6, known as Section 3 of the 221-T Building) upward and outward and to add a sufficient volume of diluting air so that the gases could be dispersed in what was thought to be a safe manner. An extensive series of meteorological tests, begun at Hanford as early as July 1943, had yielded data that du Pont Corporation scientists used to establish "dilution ratios" which were meant to assure safe dissolver off-gas dispersion. Some of these tests were conducted from the 291-T Stack, using silicon dioxide oil fog, even before T-Plant was operational. When actual operations tests and measurements in 1944 and 1945 demonstrated that 291-T (and 291-B) stack gases were concentrating and falling back down at levels greater than predicted, a program of air and vegetation monitoring was extended beyond the Hanford Site boundaries. When a flurry of "acid mists" or particulate flakes were observed near 291-T (and 291-B) in 1947, much of the duct work was replaced and sand filters were emplaced. In 1949, soon after the Soviet Union exploded its first atomic bomb, an experiment to verify gas detection instrumentation capabilities was conducted from the 291-T Stack. Known as the "Green Run," for the freshly irradiated metal that was dissolved in T-Plant for the tests, this experiment has gained national notoriety as a groundbreaking atmospheric radiation experiment. In 1950, when new "silver reactor" technology developed at the Oak Ridge Site in Tennessee showed promise in controlling iodine-131 levels in dissolver off-gases, a similar silver reactor filter was installed at T-Plant (and B-Plant). These two Hanford Site facilities thus became the first radiochemical processing facilities in the world to have their air emissions filtered in such a manner. The silver filtration technology soon became the world standard and has been used by the nuclear industry and nuclear defense sites ever since. The 291-T Building and Stack played a significant pioneering role in meteorological studies and air filtration techniques during its mission to control the airborne effluents from the 221-T Building. It is therefore the conclusion of the U.S. Department of Energy that Building 291-T Building is eligible for inclusion in the National Register of Historic Places under Criterion A as a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District.

Description of Physical Appearance

The 291-T Exhauster Building and Stack consists of a stack, three blowers, a control house, and an underground inlet and duct system.

Stack: The stack is a 200 foot tall reinforced concrete shell with an independent acid-proof brick lining. At the base, the outer diameter of the stack is 13.875 feet and the inner diameter is 11.875 feet. The stack tapers to an inside diameter of five feet. The foundation is 23 feet by 23 feet by 7 feet thick. It was built with the top of the stack foundation 19 feet below the deck level of T-Plant and 252 feet from the head face of it. The stack foundation was oriented so that the breaching opening was on the axis parallel to the 221-T Building, with the opening facing north in the same direction as the head end of T-Plant. An access door was provided opposite the breach opening. A stainless steel pan was installed in the bottom of the stack and connected to a four-inch chemical-ware drain encased in the stack base to carry off condensate or flushing water. The top 50 feet of the exterior surface of the stack was painted with an acid-resistant paint. Three 3 inch carbon lines run underground from a point outside Building 221-T to a pit adjacent to the stack, where three stainless steel steam-jet siphons discharged to the stack breaching. The pit is 13.83 feet square by 8 feet deep and partially enclosed by reinforced concrete curtain walls and roof slab.

Exhaust Fans: Three original, stainless steel fans are mounted on concrete foundations adjacent to the inlet and outlet air ducts, with the latter fan being steam-powered and enclosed in the control house. A fourth, exterior fan was added to the at a later date. The fan bases are 7.25 feet by 10.75 feet by 6.75 feet tall. All of the fans are ducted to the filters and to the stack. The fans are in line with the stack breaching and parallel to the 221-T Building. Exhaust gas was removed from the inlet duct via metal duct work between the concrete inlet duct and the fan and from the fan to the outlet concrete duct. The gas was then exhausted out through the stack.

Control House: The Control House measures 17.5 feet by 18.83 feet by 17.66 feet tall with a total area of 330 square feet. This building housed the steam engine, controls, and the third fan furthest from the stack. The structure is reinforced concrete and concrete block with a nine inch curtain wall foundation, eight inch thick concrete walls, and a six inch thick, flat, concrete roof slab covered with built-up felt, gravel surfaced roofing. It contains two doors (one double and one single door) and one window. The building was steam heated.

Inlet and Outlet Ducts: The inlet duct consists of an L-shaped underground concrete passageway with the main part four feet wide by seven feet high. It is 204.5 feet long and runs perpendicular to the 221-T Building. It is directly connected to Section 3 (between Cells 5 and 6 of T-Plant). The latter section of the inlet duct paralleled the outlet duct and was separated by a concrete wall. The wall was 12 inch thick, reinforced concrete with the inside surface painted with Bitumastic (a sealant). The outlet duct was three feet wide by four feet high and was 47 feet long.

During 1946-47, emergency shielding for additional radiation control, along with fan replacement, was installed at the 291-T Building. In mid-1948, a sand filter was installed just north of the 291-T Stack. It consisted of successively finer gradation of sand placed in an underground container 110 feet by 48 feet, and equipped with air distributors, plenum chambers, and duct work. The off-gases from T-Plant were routed through this filter via a long manifold that extended along the side bottom of the filter and moved progressively upward through layers of concrete blocks, coarse aggregate and then fine sand at the top. A large plenum chamber at the top of the filter then led the gases horizontally toward duct work leading to the stack. Much of the original steel duct work, which had corroded since its initial installation, was also replaced. In December 1950, "silver reactor" filters (beds of fiberglass material soaked with silver nitrate) were installed in the duct work leading out of the T-Plant dissolver cells into the main exhaust lines that ran between T-Plant and the 291-T Stack. Since that time, silver reactor filters have been used on a continuous basis in the T-Plant duct work.

Major Bibliographic References

Drawing W-73168.

E.I. du Pont de Nemours Corporation. 1946. *Operation of Hanford Engineer Works: History of the Project* . HAN-73214, (Books 7 & 12). Wilmington, Delaware.

Gerber, M.S. 1994. *A Brief History of the T-Plant Facility at the Hanford Site* . WHC-MR-0452, Add. 1. Westinghouse Hanford Company. Richland, Washington.

Kirkpatrick, E.E. 1946. "Directive for Emergency Shielding and Fan Replacement - 291 Building." Directive No. HEW-M-3. Office of the District Engineer, Manhattan Engineer District, Oak Ridge, Tennessee.

U.S. General Accounting Office. 1994. *Nuclear Health and Safety: Examples of Post World War II Radiation Releases at U.S. Nuclear Sites* . GAO/RCED-94-51FS. Washington, D.C.